

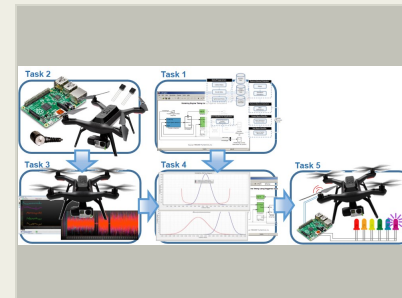
Onboard Generic Fault Detection Algorithm Development and Demonstration for VTOL sUAS, Phase I

Completed Technology Project (2017 - 2017)



Project Introduction

In the proposed SBIR study, Empirical Systems Aerospace, Inc. (ESAero) will develop a fault detection and identification avionics system implementing a generic statistical fault detection algorithm and demonstrate the system's effectiveness through flight testing on board a VTOL UAV testbed. The algorithm is aimed to be generic in the sense that it is agnostic to the specific platform or avionics suite on which it is implemented, making the developed technology broadly applicable to VTOL aircraft configurations, other aircraft types, and beyond. Using a statistics-based method, the system will not need to have direct knowledge of the sensors, the system, or the vehicle configuration. By simply monitoring the available sensors and comparing their signals to a trained nominal statistical data model, abnormalities in systems, sub-systems and individual components can be detected before a major failure occurs, greatly improving system operational safety and potentially significantly reducing maintenance costs. To develop the fault detection system, the team will leverage previous ePHM (Prognostic and Health Management) investment and configure a COTS VTOL UAV with a sensor suite and onboard data acquisition and processing system. The team will operate this VTOL UAV testbed to acquire data for nominal operation and then intentionally inject failures into the system to gather data for various faulty operations. The algorithm will be adapted to this dataset and loaded onto the testbed. Finally, in Phase I, ESAero will demonstrate the fault detection algorithm in flight verifying that the algorithm is capable of both detecting and identifying faults during actual operation. In Phase II, ESAero envisions further productionizing the technology by working with commercial motor and speed control vendors to broaden the statistical dataset and miniaturize the sensor and processing modules with the goal to integrate into existing hardware offerings.



Onboard Generic Fault Detection Algorithm Development and Demonstration for VTOL sUAS, Phase I Briefing Chart Image

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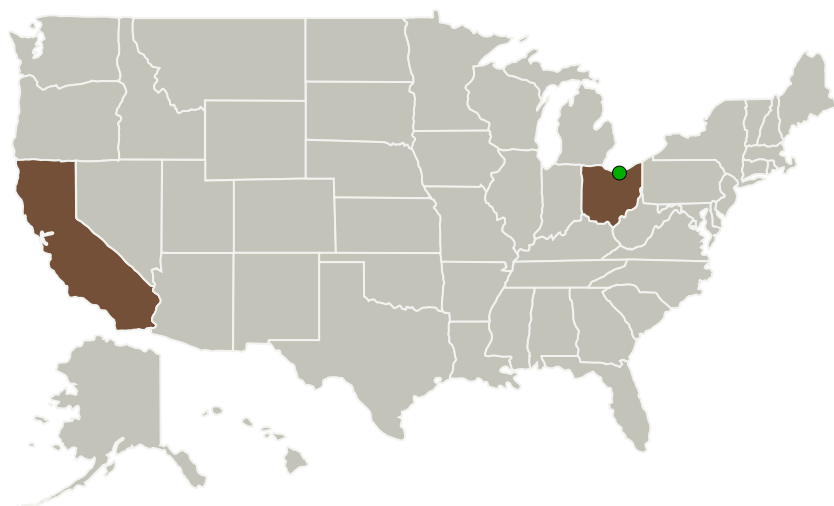
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Empirical Systems Aerospace, Inc.(ESAero)	Lead Organization	Industry	Pismo Beach, California
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations

California	Ohio
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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Empirical Systems Aerospace, Inc. (ESAero)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

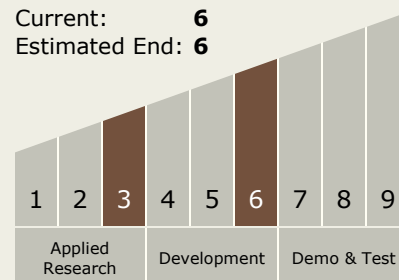
Carlos Torrez

Principal Investigator:

Philip Osterkamp

Technology Maturity (TRL)

Start: 3
Current: 6
Estimated End: 6

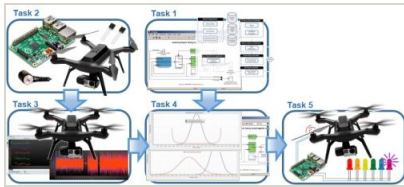


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Images



Briefing Chart Image

Onboard Generic Fault Detection
Algorithm Development and
Demonstration for VTOL sUAS,
Phase I Briefing Chart Image
(<https://techport.nasa.gov/image/127857>)

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
 - └ TX15.1 Aerosciences
 - └ TX15.1.4 Aeroacoustics

Target Destinations

The Sun, Earth, The Moon,
Mars, Others Inside the Solar
System, Outside the Solar
System